Raygrantite

\[ \text{\textit{Pb}}_{10}\text{Zn(SO}_4\text{)}_6\text{(SiO}_4\text{)}_2\text{(OH)}_2 \]

**Crystal Data**: Triclinic.  
Point Group: \( \overline{1} \).  
Twining: Pervasive fish-tail type on (12\( \overline{1} \)).  
As bladed crystals elongated to 0.30 mm and striated along [001].

**Physical Properties**: Cleavage: Good on \{120\}.  
Fracture: Uneven.  
Tenacity: Brittle.  
Hardness = ~ 3  
D(meas.) = n.d.  
D(calc.) = 6.374

**Optical Properties**: Transparent.  
Color: Colorless.  
Streak: White.  
Luster: Vitreous.  
Optical Class: Biaxial (+).  
\( \alpha = 1.915(7) \) \( \beta = 1.981(7) \) \( \gamma = 2.068(9) \)  
2V(meas.) = 76(2)\(^\circ\)  
2V(calc.) = 85\(^\circ\)  
Dispersion: r > v, strong.  
Absorption: Z > Y > X.

**Cell Data**: Space Group: \( \text{P}\overline{1} \).  
\( a = 9.3175(4) \) \( b = 11.1973(5) \) \( c = 10.8318(5) \)  
\( \alpha = 120.374(2)\(^\circ\) \) \( \beta = 90.511(2)\(^\circ\) \) \( \gamma = 56.471(2)\(^\circ\) \)  
Z = 1

**X-ray Powder Pattern**: Evening Star mine, Big Horn Mountains, Maricopa County, Arizona, USA.  
3.102 (100), 3.267 (63), 4.753 (56), 2.851 (35), 4.288 (32), 2.783 (31), 2.707 (31)

**Chemistry**:  
\[
\begin{array}{lcccc}
\text{SiO}_2 & 4.30 \\
\text{SO}_3 & 16.49 \\
\text{PbO} & 74.91 \\
\text{ZnO} & 2.59 \\
\text{H}_2\text{O} & [0.62] \\
\text{Total} & 98.81 \\
\end{array}
\]

(1) Evening Star mine, Big Horn Mountains, Maricopa County, Arizona, USA; average of 18 electron microprobe analyses supplemented by Raman spectroscopy, H\(_2\)O calculated from structure; corresponds to \( \text{Pb}_{9.8}\text{Zn}_{0.2}(\text{Si}_{0.9}\text{O}_4)_{6}(\text{Si}_{1.05}\text{O}_4)_{2}(\text{OH})_2 \).

**Mineral Group**: Iranite group.

**Occurrence**: By alteration of sulfides in a hydrothermal quartz-galena-pyrite-chalcopyrite vein.

**Association**: Galena, anglesite, cerussite, lanarkite, leadhillite, mattheddleite, alamosite, hydrocerussite, caledonite, diaboleite, fornacite, iranite, phoenicochroite, cerussite, murdochite.

**Distribution**: From the Evening Star mine (previously called Old Queen Group or Silver Queen mine), Big Horn Mountains, Maricopa County, Arizona, USA.

**Name**: Honors Raymond W. Grant, retired professor of geology, Mesa Community College, Arizona, USA.

**Type Material**: Mineral Museum, University of Arizona (#19345) and in the collection of the RRUFF Project (R120151), Tucson, Arizona, USA.

**References**:  
(1) Yang, H., M.B. Andrade, R.T. Downs, R.B. Gibbs, and R.A. Jenkins (2016) Raygrantite, \( \text{Pb}_{10}\text{Zn(SO}_4\text{)}_6\text{(SiO}_4\text{)}_2\text{(OH)}_2 \), a new mineral isostructural with iranite, from the Big Horn Mountains, Maricopa County, Arizona, USA. Can. Mineral., 54(3), 625-634.  